CONSTRUCTION
FATALITY DIGEST

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Topics of Interest

HASLAM COLLEGE OF BUSINESS
THE UNIVERSITY OF TENNESSEE, KNOXVILLE

CONSTRUCTION INDUSTRY
RESEARCH & POLICY CENTER

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Roof Falls Led Summer Construction Fatalities

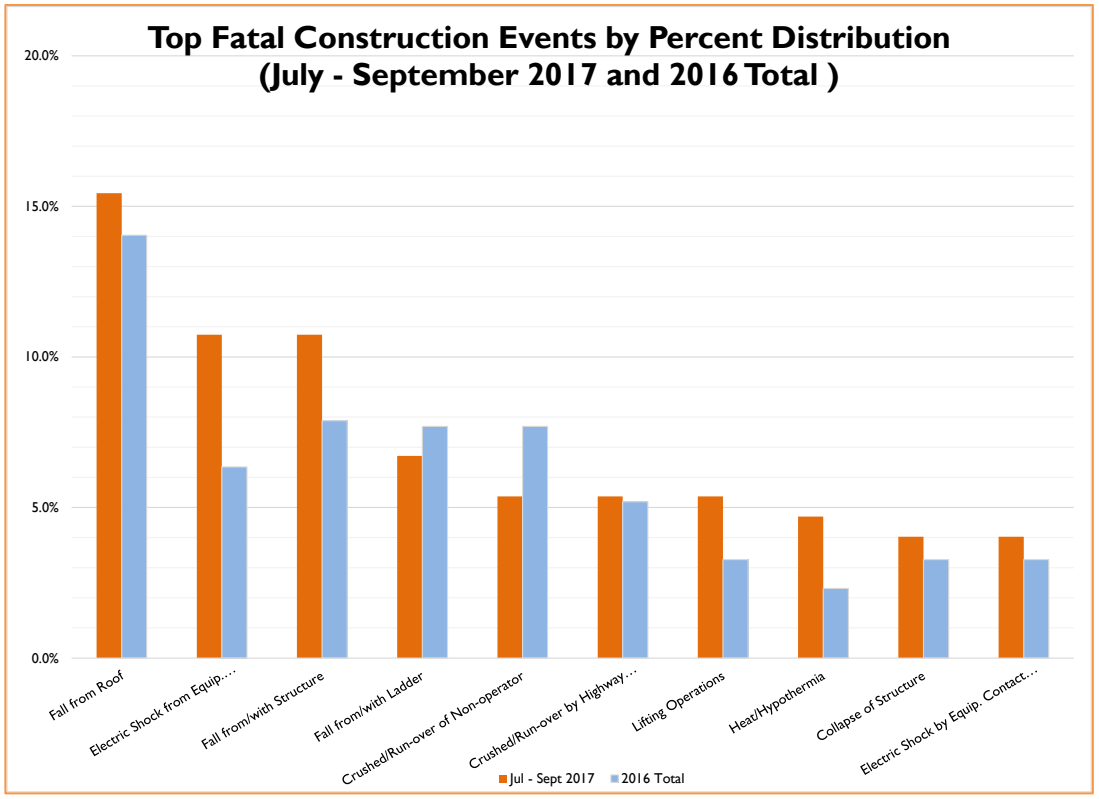
For the third quarter of 2017, CIRPC received 149 reports of fatal events in construction. For the most part the pattern of causes remained similar to the results reported for the first two quarters of 2017.

"Fall from Roof" led all categories with 23 events (15.4%) of the 149 events. This is nearly identical to the previous quarter (22 events, 15.8%). For all of 2016 "Fall from Roof" totaled 73 events (14.0%).

"Electrocution from Equipment Installation/Tool Use" and "Fall from/with Structure" were the second leading causes each with 16 events (10.7%) followed by "Fall from/with Ladder" with 10 events (6.7%), and "Crushed/Run-over of Non-operator" with 8 events (5.4%).

There were two notable shifts. "Electric Shock from Equipment Installation/Tool Use" jumped to the 2nd leading fatal cause for the third quarter. There were 11 events for the two previous quarter but 16 events (10.7%) for the current quarter. "Lifting Operations" also increased from 2.2% (in the previous quarter) to 8 events (5.4%).

All types of falls (roof, ladder, structure, opening, etc.) accounted for 41.6% (62 events) in the third quarter of 2017. This is a decrease from 46.0% (64 events) from the previous quarter. The 2016 total amounted to 42.3% (220 events).



Regional Breakdown

Of the 149 events reported for the third quarter of 2017, 22.8% came from Region 6 (34 events), 21.5% (32 events) came from Region 4, and 15.4% (23 events) from Region 5. Regions 4, 5, and 6 accounted for nearly 60% of the total.

Of these, 67.1% (100 events) were reported from Federal OSHA states, while 32.9% (49 events) occurred in State Plan states.

The breakdown by state revealed Texas with the greatest number of events with 27 (18.1%), followed by New York with 10 (6.7%).

Fatal Events Reported by OSHA Region

July to September 2017

Region	# of Cases	Percent
1	7	4.7%
2	14	9.4%
3	18	12.1%
4	32	21.5%
5	23	15.4%
6	34	22.8%
7	3	2.0%
8	2	1.3%
9	10	6.7%
10	6	4.0%
Total	149	100.0%

Fatal Events by NAICS Code

A breakdown of top reported fatal events by NAICS code shows "Roofing Contractors" at the top with 13.4% (20 events) of the total events. Other top codes are "Electrical Contractors" with 10.7% (16 events), followed by "Framing Contractors" with 7.4% (11 events), and "Highway, Street, and Bridge Construction" contractors and "Poured Concrete Foundation and Structure Contractors" both with 6.7% (10 events).

Fatal Events by NAICS Code

Code	Description	# of Cases	Percent
238160	Roofing Contractors	20	13.4%
238210	Electrical Contractors	16	10.7%
238130	Framing Contractors	11	7.4%
237310	Highway, Street, and Bridge Construction	10	6.7%
238110	Poured Concrete Foundation and Structure Contractors	10	6.7%
236220	Commercial and Institutional Building Construction	9	6.0%
238910	Site Preparation Contractors	9	6.0%
238220	Plumbing, Heating, and Air-Conditioning Contractors	7	4.7%
236118	Residential Remodelers	6	4.0%
238320	Painting and Wall Covering Contractors	6	4.0%
238990	All Other Specialty Trade Contractors	6	4.0%
236115	New Single-Family Housing Construction	5	3.4%
238120	Structural Steel and Precast Concrete Contractors	5	3.4%
238140	Masonry Contractors	5	3.4%
237110	Water and Sewer Line and Related Structures Construction	4	2.7%
237130	Power and Communication Line and Related Structures Construction	4	2.7%
238310	Drywall and Insulation Contractors	4	2.7%
237990	Other Heavy and Civil Engineering	2	1.3%
238390	Other Building Finishing Contractors	2	1.3%
236116	New Multifamily Housing Construction	1	0.7%
236117	New Housing For-Sale Builders	1	0.7%
236210	Industrial Building Construction	1	0.7%
237120	Oil and Gas Pipeline and Related Structures Construction	1	0.7%
238170	Siding Contractors	1	0.7%
238190	Other Foundation, Structure, and Building Exterior Contractors	1	0.7%
238290	Other Building Equipment Contractors	1	0.7%
238350	Finish Carpentry Contractors	1	0.7%
		149	100.0%

Top Construction Standard Violations During 2017

For the fatal events of the first three quarters of 2017, 158 case files reported a total of 593 violations of OSHA standards. Since inspectors have up to six months to issue citations on a fatality it is likely that additional citations will be forthcoming.

The violations and their frequencies are listed in the table below. The average number of violations per case with citations issued was 3.75. For the three previous calendar years, 2014, 2015, and 2016 the average number of violations per case was 3.86, 3.24, and 3.43 respectively.

The "Scaffolding" standard is the top violation for the year to date with 53 occurrences, followed by "Fall Protection" with 47, "Fall Protection Training" with 35, "Fall Protection Systems Criteria and Practices" at 31, and "Ladders" with 25 occurrences. These are the same 5 standards that ranked in the top 5 in the previous quarter.

When comparing the total of 2017 calendar year violations with OSHA's top standards violated in Fiscal Year 2016 (per www.osha.gov), there are many similarities. "Fall Protection", "Hazard Communication", "Scaffolding", and "Ladders" appear in the top standards violated on both CIRPC's and OSHA's list.

Top OSHA Standard Violations Reported in 2017

Rank	Std #	Description	# of Occurrences
1	1926.451	Scaffolding	53
2	1926.501	Fall Protection	47
3	1926.503	Fall Protection Training	35
4	1926.502	Fall Protection Systems Criteria and Practices	31
5	1926.1053	Ladders	25
6	1910.1200	Hazard Communication	19
7	1926.20	General Safety & Health Provisions	17
8	(5)(a)(1)	General Duty Clause	15
T9	1904.39	Reporting Fatalities & Multiple Hospitalization Incidents	14
T9	1926.21	Safety Training and Education	14
T9	1926.651	Excavation	14
T12	1926.416	Electrical, General Requirements	12
T12	1926.454	Scaffold Training	12
14	1926.100	Head Protection	10
15	1926.652	Excavation, General Requirements for Protection Systems	9

Trends in Fatalities – Fatal Falls in Residential Roofing: An Historical Perspective

"Residential roofing is a high risk occupation, more than nine times as risky as the average occupation and more than three times as risky as the average construction trade. To better understand the factors involved in residential roofing fatalities, 112 case reports filed by Occupational Safety and Health investigators for the years 2005–2010 were examined. In almost all of the recorded cases there was no adherence to the then current safety standards. It was found that there was little or no appropriate use of fall protection practices or equipment and that employer planning and employee training was minimal. Specific standards violated were examined as well as the monetary penalties assessed. In addition to an increase in the size of the penalties, it is hoped the recent national program "Campaign to Prevent Falls in Construction", with its emphasis on planning, needed equipment, and training will prove fruitful in mitigating falls from roofs." (Moore 2014).

Below are some of the findings from the residential roofing case files:

1. In most of the 112 incidents, fall protection was not used at all, or used incorrectly.

2. In cases where the interim standards (OSHA Residential Roofing Exemption from 1999) could have been met, all or almost all of the 41 individuals killed would have lived had they been using conventional PPE appropriately. In 15 of the 41 cases, the use of the interim standards would not have changed the outcome. For example, if the victim walked backward off the rake edge of the roof, slide guards would not have prevented the event.

3. The employees or employers did not understand and/or intentionally failed to use appropriate fall protection in the residential setting.

4. There appears to have been a serious lack of adequate training for this roofer workforce.

5. Planning was minimal in the residential setting.

Moore J., Wagner J., Fatal Events in Residential Roofing. Safety Science, Vol. 70, December 2014.

Summary of Fatal Events

Below is a random selection of 39 fatal event summaries from the 149 cases reported for the quarter. These narratives are taken directly from the reports filed by the CSHO's with only minor editing.

CATEGORY: ROOF FALLS

Inspection Number: 1246331
The victim called the owner on the phone and informed him he just fell off the roof. He explained to the owner that he would go home for the rest of the day. His co-worker agreed to drive him home. The owner received a phone call from the co-worker indicating they stopped at a store and the victim fell and struck his head in the parking lot. The owner instructed co-worker to take him to the hospital. The victim later died in the hospital from the roof fall injuries.

Inspection Number: 1250330
While employee was removing old roofing sheet metal, the employee stepped on roof insulation (where a section of the panels had been removed) and fell through it. The metal panels were 5 feet by 2 feet in size. The employee fell 40 feet through the roof and landed on the interior floor of the building.

Inspection Number: 1257783
The employee was on the porch area of the roof measuring for gutters at a height of 8 feet at a residence. According to the supervisor, the employee slipped as he was getting back on the ladder. He landed directly on his head.

Inspection Number: 1260655
A roofer was installing screws and fastener plates which hold the TPO roofing membrane in place. During this process, the roofer fell approximately 54-feet to compacted soil.

Inspection Number: 1268326
The victim was power washing a roof and while doing so he backed into a 2 foot parapet that made him trip and eventually fall from the roof. The fall height was approximately 22 feet.

CATEGORY: OTHER FALL EVENTS

Inspection Number: 1259802
An employee had set up an 8 feet tall step ladder in front of an automated swinging door. The door was triggered by the motion sensor and opened up, knocking the ladder over. The employee fell from the standing height of the second step down from the top of the ladder (about 5 ft., 9 in.), striking his head on a thin carpeted concrete floor.

CATEGORY: OTHER FALL EVENTS (Continued)

Inspection Number: 1251186
An employee was climbing a fixed ladder attached to the side of an apartment complex and the ladder broke loose causing the employee to fall two floors to the ground. The employee was transferred to the hospital by ambulance where he later passed away.

Inspection Number: 1241743
Employee was riding on the back of a flat-bed truck, when the employee fell from the truck. He landed on his head resulting in a fatal head injury.

Inspection Number: 1243431
Employee was stepping out onto a scaffolding where several planks had been overlaying scaffolding brackets. One had been removed at some point earlier in the day, leaving a section cantilevered. The employee stepped out onto the sections, the planks gave way, and he fell 7 stories to the ground below.

Inspection Number: 1243754
Victim was using a circular saw to cut the mid/top rails to allow room to install an interior wall on the fourth story of the building. Several 2x4's were leaning on the top rail, and as the victim made his last cut, the railing gave way, and he lost his balance and fell 43 feet to the ground.

Inspection Number: 1252423
The victim and another person were replacing signs in a store. They were using a 10-foot step ladder to access the area above the cosmetics aisle, which was called the gondola. The victim stepped backwards and as he turned, the surface of the gondola bent and he fell head first, approximately 7 feet, to the floor.

Inspection Number: 1256353
The employee was installing a kickplate/riser at the top of a stairway. The employee removed lag bolts that were securing stair stringers on each side of the steps. Once this was done the stairway gave way, twisting and crumbling causing the employee to fall approximately 17 feet to the concrete below.

Inspection Number: 1270219
An employee of a concrete contractor died from falling 29 stories from a formwork system platform. At the time of the accident the platform was suspended by a crane in order to re-locate it on the side of the building.

Inspection Number: 1267613
The worker was sandblasting pipes leading into a manhole, and after the work was completed, he somehow fell into the hole. The superintendent was unable to locate the victim and looked inside the manhole where the victim's body was visible at the bottom. The employee fell approximately 20 feet and came to rest on top of an existing sewage pipe and was pronounced dead at the scene.

CATEGORY: ELECTROCUTIONS

Inspection Number: 1242294
Three employees were installing aluminum gutters and downspouts to the eaves of a newly built three story townhouse. The victim was moving a 32-foot aluminum extension ladder when the wind caught it and the ladder made contact with an overhead power line and he was electrocuted.

Inspection Number: 1239273
Employee was using an electric circular saw attached to an extension cord, neither of which were equipped with ground prongs, and received an electrical shock.

Inspection Number: 1251835
Employees were changing out a power pole and while moving a primary neutral, there was an electrical arc down through the pole to the ground. The victim electrocuted was standing on the ground near the pole.

Inspection Number: 1242644
Employee working alone in the vestibule area that leads to the school bus loop of a school. The employee was rewiring some light circuitry above a drop grid ceiling from a fiberglass ladder as the school reported a problem with the exterior lights turning off when the hall lights would be turned off. The employee was found by the school custodian laying across the ceiling grid by his mid-section with his feet still on the fiberglass ladder. Two junction boxes within the grid ceiling had the covers off. An orange electrical wire was charred and hanging from the smaller junction box. Both hands of the employee had burn marks. The breaker controlling the light circuits was found to be energized and on a 20 amp circuit and operating at 277 volts.

CATEGORY: STRUCK BY, RUN OVER, CRUSHED BY OPERATING CONSTRUCTION EQUIPMENT OR VEHICLE

Inspection Number: 1237781
The victim was painting a ledge from atop of a wooden pallet that was being lifted by a rough terrain forklift operated by a co-worker. The victim was pinned to the wall's window and ceiling by the rough terrain forklift lifting mechanism.

Inspection Number: 1249755
A co-worker had parked a tractor, equipped with a bucket attachment and a backhoe attachment, on the uphill side of where work was to be done. The bucket was facing uphill and had been lowered into the earth to secure the tractor. The victim had placed rocks behind the rear wheels of the tractor to scotch the tires. Both the victim and the co-worker were in a gully, approximately 15 to 20 feet behind the parked tractor, discussing how to do the task at hand. The victim warned the co-worker the tractor was moving and both men tried to get out of the path of travel. Due to the uneven terrain, the tractor did not roll in a straight path and struck the victim as he was trying to flee the path of the tractor. He was pinned between the rear tire and a tree.

CATEGORY: STRUCK BY, RUN OVER, CRUSHED BY OPERATING CONSTRUCTION EQUIPMENT OR VEHICLE (Continued)

Inspection Number: 1247579
The victim was working on a truck and was between the frame rail and the bed. No safety blocks were in use. Another employee was working on the hydraulic controls and he thought the victim was not under the bed and lowered the bed onto the victim's head crushing him between the bed and the frame rail.

Inspection Number: 1269338
The victim and a coworker were taking asphalt samples in a controlled work zone on an interstate, when an impaired driver drove onto a closed lane of traffic and struck and killed the victim.

Inspection Number: 1265363
Employee was on-site alone grading gravel road while operating a road grader. The employee, while operating the road grader, was struck by a train.

Inspection Number: 1249903
Employee was operating a John Deer mower along an interstate when he was struck by a tractor trailer.

CATEGORY: OTHER FATALITY CAUSES

Inspection Number: 1244199
At about 11:00AM, workers attempted to remove a 24-inch rubber plug from a 24-foot deep well by pulling on a 1/4-inch nylon rope that was attached to the 24-inch plug. The plug was lodged inside a T-shaped PVC fitting from the force of the waste water emptying into the well. Without any respiratory protection, the first victim climbed down the ladder with a crowbar to dislodge the deflated 24-inch rubber plug which was about 8-feet below the top of the well. He had difficulty releasing the plug with the crowbar and started to make his way up the ladder. He lost consciousness when he was about 2 feet from the top of the well and fell into the 24-foot deep well. The second victim descended down the ladder to provide help but lost consciousness and went underwater. The waste water level was about 3 feet deep at this point. The third victim then climbed down the ladder and also lost consciousness. All three workers were asphyxiated by hydrogen sulfide gas.

Inspection Number: 1268064
An employee replacing a roof of a building was struck by an approximately 1,400 lb. load, knocking the employee off the building roof and falling approximately 45-feet to pavement.

CATEGORY: OTHER FATALITY CAUSES (Continued)

Inspection Number: 1240936
An employee was cutting duct work during demolition operations. The duct work fell and knocked the employee off of a small scaffold. The employee fell approximately 5-feet to the ground. The employee was hospitalized and passed away from head trauma and broken vertebrae.

Inspection Number: 1240488
Two employees were in the process of excavating an area under an existing stone foundation. One of the employees was under the existing foundation when a large rock used for the existing foundation came loose, struck the employee and trapped him under it. He was pronounced dead at the scene.

Inspection Number: 1252629
An employee was setting up a ladder to climb the exterior of a residence to conduct residential insulation tasks. While setting up the ladder, a bee or hornet's nest was disturbed. One of the workers was stung at least 4 or 5 times, allegedly causing the employee to go into anaphylactic shock.

Inspection Number: 1261322
While pouring cement from a long boomed truck, an employee was struck by and killed by the boom when it failed and fell. In addition a second employee was stuck in the legs breaking both his legs.

Inspection Number: 1248249
The deceased was operating a wood chipper machine. A piece of metal suddenly flew out of the machine and struck the deceased in the chest killing him.

Inspection Number: 1259707
The work crew was conducting drilling and blasting work on a bench (dirt embankment), when, prior to blasting, the embankment gave way and slid approximately 600 feet down. The employee went with the bench and approximately 15,000 yards debris.

Inspection Number: 1242393
The victim was working at a customer location to install air conditioning when it was noticed that the employee was over heated (by another employee). He was told to go to the truck to cool off in the AC and drink some fluid. About 45 minutes later he was called by another employee on the site to help him move an AC unit. When the victim stepped out of the truck the other employee noticed his lips where blue and after he took couple of steps, he collapsed on the floor. Police and ambulance where called to the scene and they try to resuscitate him for about 45 minutes. He was pronounced dead on the scene.

CATEGORY: OTHER FATALITY CAUSES (Continued)

Inspection Number: 1257366
The crew was repositioning steel trusses using a forklift, a truss jib attachment and a wire rope. The steel truss was not balanced when it was lifted. The truss was set down by the operator in a vertical upright position and the deceased was asked to untie and reposition the wire rope to center on the steel truss. In the process of untying the wire rope from the truss, the truss fell over, struck and killed the victim.

Inspection Number: 1264675
The company was pouring concrete to build columns and using a tower crane. The sling broke on the bucket. The contents weight was between 13,000-14,000 lbs. It fell approximately 15 feet striking the employee who was working in the area.

Inspection Number: 1246618
The employee was standing in front of a concrete box culvert that was positioned approximately 2 feet from the track of an excavator with his back facing the box. The excavator operator began rotating the equipment to the left to pick up another box culvert and the counterweight swung to the right striking the box culvert and knocking it over. The employee was struck by the box and crushed between the box and the ground.

Inspection Number: 1239933
An employee entered a trench 7-feet in depth, which then collapsed, pinning the victim between the fallen dirt and the trench wall.

Inspection Number: 1241295
The employees were in the process of removing the bucket from a skylift in order to transport it on a trailer. While in the process of attempting to remove the bucket, the flagman was signaling the operator to scope out and that's when the flagman noticed the skylift tipping over to the right. The flagman stated that he hollered to “watch out” and that's when the decedent who was positioned the in the back of the skylift ran towards the front and in the line of fire and was struck by the skylift.

Inspection Number: 1238230
The decedent was on the job for approximately two and a half hours. When the decedent first arrived, he was tasked with picking up the site. At approximately 7:15 AM the decedent and another employee were tasked with using shovels to back fill a hole at the base of a pillar. The decedent said he wanted to take a break and did so around 8:15 AM. The decedent returned to the task shortly afterwards then approximately 9:15 AM went on break again. A forklift driver noticed the decedent sitting in his truck slumped over at approximately 9:30 AM. A cool wet towel and water was applied to the decedent to attempt to cool him down. The ambulance arrived in approximately five minutes and took the decedent to the hospital where he was pronounced dead from heat stroke.

Confined Spaces in Construction: Sewer Systems

OSHA has developed a new construction standard for Confined Spaces (29 CFR 1926 Subpart AA) — any space that meets the following three criteria:

- Is large enough for a worker to enter it;
- Has limited means of entry or exit; and
- Is not designed for continuous occupancy.

The new Confined Spaces standard includes several requirements for safe entry. Preparation: Before workers can enter a confined space, employers must provide pre-entry planning. This includes:

- Having a competent person evaluate the work site for the presence of confined spaces, including permit-required confined spaces.
- Once the space is classified as a permit-required confined space, identifying the means of entry and exit, proper ventilation methods, and elimination or control of all potential hazards in the space.
- Ensuring that the air in a confined space is tested, before workers enter, for oxygen levels, flammable and toxic substances, and stratified atmospheres.
- If a permit is required for the space, removing or controlling hazards in the space and determining rescue procedures and necessary equipment.
- If the air in a space is not safe for workers, ventilating or using whatever controls or protections are necessary so that employees can safely work in the space.

(Information courtesy of OSHA)

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We would like to thank OSHA's Dave Schmidt for help in obtaining the data used in this newsletter. Comments and suggestions can be directed to John Wagner (jpwagner@utk.edu) as we work together to contribute to a safer construction workplace.